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AN ATTEMPT TO SHOW THAT THE WALLS AND FLOORING OF ORDINARY HOSPITALS ARE LARGELY CONCERNED IN THE PRODUCTION OF THOSE SEPTIC POISONS WHICH GIVE RISE TO PYÆMIA, ERYSIPELAS, AND PUERPERAL FEVER; WITH SUGGESTIONS FOR REMEDYING THE EVIL.

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Mr. President and Gentlemen,—The views I have undertaken to bring before you this evening are offered more for discussion than for acceptance as recognised facts. They are based on a discovery of great hygienic value, recently made by Dr. John Dougall, of Glasgow, who has shown most conclusively, that when organic matter undergoes decomposition in the presence of an alkali, the putrefactive process is induced, with its accompanying offensive odour and health-destroying products; and that this takes place much more readily than when organic matter undergoes decomposition in the presence of a neutral substance; but when organic matter undergoes decomposition in the presence of an acid, the fermentative process is induced, accompanied by a not unpleasant mouldy aroma and innocuous products.

I have repeated Dr. Dougall's experiments, and can vouch for the correctness of his results. His paper on the subject was read at the Social Science Congress, Glasgow, and is well worthy of perusal. It may be found in the columns of *Public Health*, for May 6th and 15th.

Now, with a knowledge of the fact that alkalies favour the putrefactive process when brought into contact with decomposing organic matter, can we wonder that outbreaks of pyæmia, erysipelas, and puerperal fever, are of such common occurrence in our ordinary hospitals? Alkaline walls, alkaline ceilings, and alkaline floors—floors rendered alkaline by the soap used in cleansing them; these are dangerous surroundings for patients with open wounds, and for lying-in women, who are incessantly giving off from their bodies large quantities of organic matter of that peculiar kind which

Mr. Simon, in an official Sanitary Report, recently issued, has declared to be capable, when undergoing putrefactive decomposition, of generating erysipelas, pyæmia, septicæmia, and puerperal fever.

At one of our meetings last year, I drew your attention to the fact, that in consequence of the great and long-continued prevalence of pyæmia in the surgical wards of the Leipzig Hospital, which is described as a fine stone building, Professor Thiersch decided on abandoning them, and on having wooden sheds erected for surgical purposes on either side of the old building; and I gave you his results for the first year in these wooden sheds. He performed 266 serious bloody operations, and did not lose a case from pyæmia; whilst in the old hospital, from forty to fifty patients died of this disease annually.

At the time, I attributed this marvellous immunity from pyæmia enjoyed by the inmates of the wooden sheds, to the mild but incessant generation of peroxide of hydrogen by the turpentine contained in the wood; but as turpentine always gives an acid reaction, I am now disposed to think that this property must have greatly aided the disinfecting powers of the peroxide, by determining the fermentative, instead of the putrefactive decomposition of the pus-cells and other organic matter given off from the patients. It is worthy of remark that nearly, if not all those substances which spontaneously generate peroxide of hydrogen, at the same time acquire an acid reaction; and further, that chemically prepared peroxide of hydrogen cannot be preserved without the addition of a little acid.

All alkalies, on the other hand, destroy peroxide of hydrogen, and when added to those substances which spontaneously generate it, prevent its formation. Thus it would seem that acids are the natural allies of peroxide of hydrogen, for they are not only simultaneously generated, but they give it stability, and act in concert with it as deodorisers and disinfectants.

I think the day is not very far distant, when the true value of peroxide of hydrogen, both as a therapeutic agent, and as a disinfectant, will be fully recognised by the profession. As long ago as July 1871, in a paper read before this Society, I recommended its use as an external application to the bodies of small-pox patients, for the purpose of preventing the spread of the disease; and I based my theory on the remarkable property possessed by pus-cells, of giving increased activity to the peroxide, by transforming a portion of its oxygen into nascent oxygen or ozone. This view has recently been very strongly backed up by Dr. W. B. Richardson, in a paper read before the Society of Medical Officers of Health, entitled, "Some New Researches on the Cause and Origin of Fever from the action of the Septinous Poisons." I have not yet seen his paper in full, but the following extract taken from *Public Health*, will show you that his views do not differ from mine regarding the chemical action

which takes place when septic poisons and peroxide of hydrogen are brought together: "He found that it was the property of all the septic poisons to liberate oxygen from that solution of oxygen known as peroxide of hydrogen. This fact was illustrated by showing the action of minute portions of pyæmic poison, vaccine, pus, decomposing blood, and other similar bodies. A solution of peroxide containing ten volumes of oxygen was placed in tubes, and was inoculated with the various specimens of septic matter, with the effect in each case of causing a rapid evolution of the oxygen."

Now, although it has not fallen to my lot to be in a position to test the value of my theory for the suppression of small-pox, nor has it, that I am aware of, ever been tried, I have had ample opportunities of applying it to the suppression of scarlet fever, and I will tell you in a few words what have been my results. Since April, 1873, I have attended scarlet fever in thirty-five houses, some of them large schools, and others hotels, and in only three of them have I failed to arrest the spread of the disease.

My plan has been to have the patients freely rubbed from head to foot, three times a day, with ethereal solution of peroxide of hydrogen (erroneously called ozonic ether) and lard, in the proportions of one part to eight. The inunctions have been continued for a fortnight or three weeks. When the throat symptoms have been severe, I have prescribed a gargle of ethereal solution of peroxide of hydrogen and water, in the proportions of two drachms to eight ounces, to be used frequently. Every patient made a good recovery, and desquamation of the cuticle very seldom occurred. No internal medicines of any kind were given.

I am aware that I have rather digressed from my subject, but trust the few remarks I have made regarding the power that peroxide of hydrogen seems to possess of destroying the poison-germs of other diseases than those under our consideration, may not appear out of place.

Now comes the important question:—If certain diseases, such as pyæmia, erysipelas, and puerperal fever, are generated in hospitals, can we do anything to mitigate the evil? I think we can, and I will offer you, by way of illustration, the successful results of a method adopted some few years ago for banishing pyæmia from the wards of the Royal Hants Infirmary, Southampton. The disease had prevailed for a long time in this infirmary, and had assumed a very malignant type; when, at the suggestion of Dr. Charles Langstaff, one of the surgeons to the institution, the walls were, in some parts of the building, rubbed smooth and coated with a varnish composed of paraffin and oil of turpentine; and in other parts, they were thoroughly painted, then well rubbed down, and, after receiving a final coat of paint, well varnished. The floors, after being carefully planed, were coated with paraffin driven into the boards by means of heat, and then polished with oil of



turpentine. The wooden furniture was painted with paraffin dissolved in oil of turpentine. This was all done with the sole object of rendering the various surfaces of the walls the floors and the furniture non-absorbent, and this object was doubtless, in a great measure, attained ; and what is better still, that fell disease, pyæmia, was exterminated. I do not, however, think that this grand result was entirely brought about by the mere conversion of absorbent into non-absorbent surfaces in the infirmary wards. The walls no longer presented an alkaline surface, nor did the floors, which previously were rendered alkaline by the use of soap in cleansing them ; but instead, as a consequence of the admixture of linseed oil and oil of turpentine with the substances used for rendering them non-absorbent, they acquired an acid reaction, and also the property of continuously acting on the atmospheric oxygen and converting it into peroxide of hydrogen—a substance specially adapted for hospital disinfection, on account of its peculiar property of giving off nascent oxygen, when brought into contact with either pus or blood cells.

Nearly all authorities on hospital hygiene now deprecate the use of soap and water in cleansing the floors. Dr. Parkes says, in speaking of erysipelas as a hospital epidemic, “Moisture of the the floors, causing constant great humidity of air, has also been supposed to aid it.”

In my opinion, the floors of hospitals may very easily be kept sweet and wholesome, and even permanently disinfectant ; but the walls, ceilings, and furniture, and beyond all the atmosphere, are more difficult to manage.

Here is a board which was first brushed over with equal parts of gasoline and boiled linseed oil, to which a little benzoic acid had been added ; and when dry, polished with a thick paste composed of bee's-wax and turpentine, with benzoic acid, in the proportion of two drachms to the pound, added. I consider that boards prepared in this way are rendered almost permanently disinfectant. The gasoline, linseed oil, and oil of turpentine, all get embedded in the wood, and generate peroxide of hydrogen ; the benzoic acid is added on account of its great power of destroying all the lower forms of organic life ; and the wax is of course used for the purpose of combining these substances and affording a polish. This composition gives a decidedly acid reaction. It was for boards thus prepared that I was awarded a first prize at the Intercolonial Exhibition. So many substances, which might be applied to boards, generate peroxide of hydrogen, that I have no doubt my method could easily be improved on.

For the purpose of rendering the walls and ceilings of hospitals non-alkaline, either of the plans recommended by Dr. Langstaff, and to which I have already alluded, would answer very well ; or what perhaps might answer better still, would be to thoroughly

coat them over with silicate paint, and then rub them down and varnish them. Very beautiful enamelled ceilings are now being made by the Enamelled Iron Company in Birmingham, which would answer admirably, not only for the ceilings, but I think also for the walls of hospitals.

The furniture of a hospital might easily be rendered disinfectant in a variety of ways. For instance, it might be occasionally brushed over with either gasoline or benzine, in which a little benzoic acid has been dissolved. The smell from these hydrocarbons soon passes off, but their disinfecting properties will remain for a very long time. Or it may be rubbed with any of the ordinary compounds sold as furniture polish, provided they do not contain an alkali. They nearly all contain some ingredients which generate both acids and peroxide of hydrogen, such as oil of turpentine, linseed oil, and resin.

With regard to atmospheric disinfection, either in our hospitals, our public buildings, or our dwelling-houses, common sense tells us that we should turn out the foul air, and let in pure fresh air in its stead; but this alone has often been found insufficient for the purification of hospital air, more particularly in the surgical wards, where pus-cells are apt to accumulate, and to give rise, whilst undergoing decomposition, to the most dangerous consequences.

Now if it be true that pus decomposes peroxide of hydrogen, and sets free nascent oxygen, which not only oxidises the pus, but also any other putrescible organic matter which may be present; we may I think rationally conclude, that certain volatile substances, such as gasoline, benzine, and eucalyptus oil, all of which possess the property of generating peroxide of hydrogen, would be found suitable disinfectants for the atmosphere of a hospital.

